



Faculty of Engineering

HYDRAULIC MODEL OF DAM BENGHOH FOR FLOOD MITIGATION IN SARAWAK KIRI RIVER

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**Bachelor of Engineering with Honours
(Civil Engineering)
2010**

UNIVERSITI MALAYSIA SARAWAK

R13a

BORANG PENGESAHAN STATUS TESIS

Judul: HYDRAULIC MODEL OF DAM BENGHOH FOR FLOOD MITIGATION
IN SARAWAK KIRI RIVER

SESI PENGAJIAN: 2006/2007

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River

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This project is submitted to
Faculty of Engineering,
University Malaysia Sarawak
in partial fulfilment of
the requirement for the
degree of Bachelor of Engineering with Honours
(Civil Engineering) 2010

I would like to dedicate this thesis to God, my family and friends.

ACKNOWLEDGEMENTS

First and foremost I offer my utmost gratitude to my supervisor, Prof. Dr. Federik Joseph Putuhena, who has supported me throughout my thesis with his patience and knowledge. I attribute the level of my degree to his encouragement and effort and without him this thesis, too, would not have been completed or written.

Besides, I also wish to express my appreciation to Dr. Mah Yau Seng on his guardian, guidance and advices on the entire research, whom has also supported me throughout my thesis with his patience and knowledge.

Many thanks to the Project Manager, Ir. Philip Lee, Assistant Project Manager, Mr. Jeffrey Dickson and Engineers, Mr. Tony Lee and Mr. Willie Sang of Naim Holdings Berhad for their kind assistants and provision of invaluable data knowledge for my research.

Besides, many thanks to the Department of engineering, UNIMAS for provision of support in completion of my thesis and panels who are going to evaluate this thesis.

Finally, I thank my parents for supporting me throughout all my studies at the University and their provision of love and care.

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LIST OF ABBREVIATIONS

C	- Discharge coefficient
DID	- Department of Irrigation and Drainage
Eq.	- Equation
etc.	- et cetera
FSL	- Full Supply Level
Hr	- Hour
H	- Head on crest
I	- Inflow rate
JKR	- Jabatan Kerja Raya
km	- kilometer
Kpg.	- Kampung
L	- Crest length
LSD	- Land and Survey Datum
m	- meter
mm	- milimeter

O	- Outflow rate
PMF	- Probable Maximum Flood
PMP	- Probable Maximum Precipitation
Q	- Discharge rate in m^3/s
RL	- Reduced Level (to LSD)
S	- Storage
Sg.	- Sungai
t	- time
WMO	- World Meteorological Organisation
Δt	- Time interval
C_o	- Ogee crest coefficient
H_e	- Actual head on crest
H_o	- Design head
K_a	- Abutment contraction coefficient
K_p	- Pier contraction coefficient
m^3/s	- Meter cube per second
Mm^3	- Million meter cube

WL	- Water level
RS	- River System
3D	- Three Dimensional
A	- Area in km ²
DTM	- Digital Terrain Model
ESRI	- Environmental Science Research Institute
ESRI	- A GIS software package of ESRI
ArcView	
Geoplan	- Geological Plan, a GIS tool of InfoWorks RS
GIS	- Geographical Information System
InfoWorks	- A licensed hydraulic modeling software of Wallingford Software Ltd, UK.
InfoWorks	- River Simulation, a modeling software package of InfoWorks
RS	
ISIS	- A Licensed hydraulic modeling software of Wallingford
ΔT	- Time Step
AutoCAD	- Automatic Computer Aided Design
DUFlow	- Dutch Flow, a licensed hydraulic modeling software

- HEC - Hydrologic Engineering Centre
- HEC-RAS - A modeling software package of HEC
- TIN - Triangular Irregular Network

Abstrak

Sungai Kiri Sarawak pernah mengalami peristiwa bencana banjir semasa tempoh dari 9 hingga 13 Januari 2009. Pada tempoh tersebut, bendungan Bengoh masih dalam pembinaan. Empangan Bengoh dicadangkan telah dikemukakan sebagai bendungan persediaan air yang juga berfungsi sebagai langkah pengurangan kesan banjir sepanjang Sungai Sarawak. Empangan Bengoh yang dicadangkan adalah 3.25km jauh dari Kampung Git, dengan tingkat puncak di ketinggian 77.5m. Empangan ini juga direka untuk mengekalkan isipadu air dari hulu untuk mengelakkan pembanjiran sepanjang Sg. Sarawak Kiri. Tujuan utama projek ini adalah untuk meninjau kemampuan empangan air Bengoh untuk mengurangkan banjir dengan mengulangi peristiwa banjir Januari 2009 dengan empangan Bengoh sekali dalam simulasi. Sungai Sarawak dan dataran banjir dimodelkan dengan pendekatan satu dimensi pemodelan hidrodinamik, dengan menggunakan model Perisian Wallingford - InfoWorks River System (RS), digabungkan dengan aplikasi GIS, untuk mendapatkan hidrograf banjir sungai dan dataran banjir dalam keadaan ekstrem situasi banjir Januari 2009. InfoWorks RS diterapkan di Sungai Sarawak dari hujung hulu Sungai Sarawak Kanan dan takungan Bengoh hingga hilir *barrage*. Hasil simulasi menunjukkan bahawa model RS InfoWorks mampu memberikan gambaran yang jelas peristiwa banjir 2009 Januari yang ditinjau dengan menitikberatkan situasi banjir di mana air banjir yang mengalir di luar saluran sungai dan pola penyebaran. Simulasi lokasi di Batu Kawa, Sg. Maong dan Grand Hotel Margarita kemudian digunakan sebagai perbandingan untuk sebelum dan selepas pembinaan empangan Bengoh untuk mempelajari kesannya. Pemodelan Sg. Sarawak dengan empangan Bengoh menunjukkan bahawa ia mampu menahan banjir dan mengurangkan pelepasan air dari hulu, maka, ini membuktikan bahawa empangan Bengoh berfungsi mengurangkan tahap banjir.